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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/922,804	08/07/2001	Michikazu Matsumoto	740819-610	8887
22204	7590	06/10/2004	EXAMINER	
NIXON PEABODY, LLP 401 9TH STREET, NW SUITE 900 WASHINGTON, DC 20004-2128			ERDEM, FAZLI	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/922,804

Applicant(s)

MATSUMOTO ET AL.

Examiner

Fazli Erdem

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-6 and 8-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4, 5, 8 and 9 is/are allowed.
- 6) ☒ Claim(s) 6 and 10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Allowable Subject Matter

1. Claims 4, 5, 8 and 9 allowed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 6 rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (6,346,467) in view of Hsu et al. (5,759,916).

Regarding Claim 6, Chang et al. disclose a method of making tungsten gate MOS transistor and memory cell by encapsulating where in Fig 1(a), polysilicon layer 3 is deposited or gate oxide layer 2. On top of polysilicon layer 3, a barrier layer or titanium nitride 3 has been deposited. A tungsten gate electrode layer 5 is deposited on barrier layer 3. Column 6 describes that the annealing has been done over temperatures 800 Celcius. Chang et al. fail to disclose the required stoichiometric ratio of titanium being rich compared to nitride in the barrier layer. However, Hsu et al. disclose a method for forming a void-free titanium nitride anti-reflective coating layer upon an aluminum containing conductor layer where in the abstract section the required stoichiometric ratio is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required stoichiometric ratio of titanium to nitride in Chang et al. as taught by Hsu et al. in order to have an electrode structure with higher reliability.

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3. Claim 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (6,346,467) in view of Hsu et al. (5,759,916) further in view of Konecni et al. (6,215,186).

Regarding Claim 10, Chang et al. disclose a method of making tungsten gate MOS transistor and memory cell by encapsulating where in Fig 1(a), polysilicon layer 3 is deposited on gate oxide layer 2. On top of polysilicon layer 3, a barrier layer or titanium nitride 3 has been deposited. A tungsten gate electrode layer 5 is deposited on barrier layer 3. Column 6 describes that the annealing has been done over temperatures 800 Celcius. Chang et al. fail to disclose the required stoichiometric ratio of titanium being rich compared to nitride in the barrier layer and the second barrier layer or titanium nitride. However, Hsu et al. disclose a method for forming a void-free titanium nitride anti-reflective coating layer upon an aluminum containing conductor layer where in the abstract section the required stoichiometric ratio is disclosed. Furthermore, Konecni et al. disclose a system of method of forming a tungsten plug where in Fig 5, 18 is the first titanium nitride layer and 20 is the second titanium nitride layer.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required stoichiometric ratio of titanium to nitride and the second barrier layer of titanium nitride in Chang et al. as taught by Hsu et al. and Konecni et al. in order to have an electrode structure with higher reliability.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FE
June 2, 2004

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

